

M-2

LIGHT STANDARDS SPECIFICATIONS

Description

This work consists of installing street lights.

Materials

Materials shall conform to the following:

Concrete shall contain a minimum of 4 percent of entrained air, as determined by AASHTO T 152. Concrete shall have a slump of not more than 4 inches as determined by AASHTO T 119. The maximum water/cement ratio shall be 0.49. The minimum cement factor shall be 6-1/2 bags per cubic yard. The concrete shall develop a minimum compressive strength of 3,000 psi in 28 days.

Water shall conform to AASHTO M 157. Water shall contain no substances detrimental to the finished product. Potable water of known quality may be used without testing.

Air entraining admixtures shall conform to the requirements of AASHTO M 154.

Calcium chloride shall conform to AASHTO M 144, Type L.

Chemical admixtures shall consist of water-reducing, set-retarding, and set-accelerating, or combinations thereof, that conform to the requirements of AASHTO M 194. When combining chemical admixtures, they shall be compatible with each other.

Coarse aggregate shall meet the requirements of AASHTO M 80, Class A. Do not use aggregate known to polish or carbonate aggregates containing less than 25% by weight of insoluble residue as determined by ASTM D 3042. Aggregate size shall conform to AASHTO M 43, No. 2. The adherent coating on the aggregate shall not exceed 1.0 percent in accordance with FLH T 512.

Fine aggregate shall be a sand that conforms to AASHTO M 6, Class B, except that the material passing a No. 200 sieve is limited to 3.0 percent. However, when the material finer than 2 µm (determined in accordance with AASHTO T 88) is less than 2%, the material passing the No. 200 sieve is increased to 5 percent. Perform the sulfate soundness test, AASHTO T 104, using sodium sulfate. The supplemental requirements of AASHTO M 6 for reactive aggregates are applicable. Fine aggregate shall have a minimum sand equivalent value of 75 when tested in accordance with AASHTO T 176, Alternate Method No. 2.

Curing materials shall consist of the following:

Burlap cloth conforming to AASHTO M 182.

Waterproof paper conforming to AASHTO M 171.

Polyethylene film conforming to AASHTO M 171.

Liquid membrane forming compounds conforming to AASHTO M 148.

Concrete Composition. Before batching concrete, submit the proposed concrete proportions for approval. As a minimum, submit the following:

- (a) Type and source(s) of all materials proposed for use.
- (b) Materials certification for all materials proposed for use.
- (c) Saturated surface dry weight of the fine and coarse aggregate per cubic yard of concrete.
- (d) Gradation of fine and coarse aggregate.
- (e) Weight per cubic yard of mixing water.
- (f) Weight of cement and fly ash per cubic yard of concrete.
- (g) Entrained air content of plastic concrete in percent by volume.
- (h) Maximum slump of plastic concrete in inches.

Backer rod shall be a closed-cell polyethylene conforming to ASTM D 3205, Type 1. Use a compatible sealant as recommended by the manufacturer of the rod.

Conduit shall meet the following requirements:

Non-metallic conduit and duct couplings, elbows, bends, and nipples shall be rigid PVC, heavy wall conduit for above ground and underground use without concrete encasement conforming to UL 651. Furnish solvent cement to join conduit conforming to ASTM D 2564.

Metallic conduit and duct, couplings, elbows, bends, and nipples shall be rigid galvanized steel conforming to UL 6, with rigid, full weight sherardized or galvanized threaded fittings. Furnish conduit uniformly coated on the outside with an asphalt mastic in accordance with AASHTO M 243 or a 20 mil PVC coating.

Flexible conduit shall be liquid-tight metallic conduit conforming to UL 360, acceptable for equipment grounding, and with insulated throat, grounding, malleable iron watertight fittings.

Galvanized steel conduit bodies, boxes, and fittings shall be watertight and conform to UL 514 B.

Pull boxes, and frames and covers for boxes formed in concrete may be cast iron or welded sheet steel having a minimum thickness of 3/16 inch or 7 gauge, double hot-dipped galvanized, inside and out, after fabrication, in accordance with ASTM A 153.

Galvanize hardware in accordance with ASTM A 153, when specified.

Iron oxide primer shall be in accordance with SSPC Paint 25, when specified.

Cable shall be color coded, rated 600 volts, with conductors, insulation and jacket. Furnish stranded copper conductors with identification labels or tags showing the manufacturer's name, gauge, UL symbol, and the type of wire or cable.

Wire and cable shall conform to the following requirements:

- UL 44 Rubber-Insulated Wires and Cables
- UL 83 Thermoplastic-Insulated Wires and Cables
- UL 493 Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
- UL 719 Non-metallic Sheathed Cable

UL 854 Service Entrance Cables
UL 1063 Machine-Tool Wires and Cables
UL 1581 The reference Standard for Electrical Wires, Cables, Flexible Cords

Circuit breakers and panels shall meet requirements of UL 489 and UL 67. Furnish molded case thermal magnetic trip type breakers. Furnish panels enclosures meeting NEMA 3R, lockable with padlocks.

Safety disconnect switches shall be heavy duty, NEMA 3R, conforming to UL 98.

Grounding and bonding equipment shall consist of 5/8-inch diameter, 8-foot long, copper-clad steel ground rods, ground clamps, grounding and bonding bushings, and lock nuts meeting the requirements of UL 467.

Contactor shall be a magnetic, 60-amp, 2-pole contactor with a 120-volt coil, equipped with control switches for automatic actuation meeting UL 508. Furnish cadmium-sulphide type photocell controls for 120 or 240-volt operation, as applicable; rated at 1000 watts resistive load or 1800 volt-amperes inductive load; adaptable for pole-top mounting in a plug-in, locking-type receptacle, meeting UL 773; and with a built-in surge protective device for protection from induced high voltage and follow-through currents.

Furnish single-phase, 240/480 volt primary, 120/240 volt secondary, dry type, 60 hertz, 1 KVA transformers for indoor or outdoor use, conforming to UL 506.

Secondary lightning arrester shall be rated for a maximum operating voltage of 650-volts RMS; with a bracket for mounting on the control cabinet backboard.

Service poles for power supply shall be made of treated Southern Yellow Pine, treated Douglas Fir, butt-treated Western Red Cedar, or butt-treated northern white cedar. Furnish Class 4 services poles, 30-foot minimum length. Treat poles with a waterborne ACA or CCA preservative according to the applicable requirements of AWPAC 1 and AWPAC 14.

Meter cabinets shall meet local power company requirements.

Control cabinet shall be a NEMA Type IV cabinet, equipped with door clamps on the unhinged sides, solid neoprene gasket, welded seams, continuous hinge with stainless steel pin, stainless steel external hardware, backboard for mounting apparatus, padlock with an outdoor, tumbler-type padlocks keyed the same, supplied with two keys for each lock. Furnish a cabinet constructed of either (1) code-gauge stainless steel, ASTM A 167, Type 304, or (2) code gage aluminum sheet alloy, No. 5052-H32, with mechanical properties equivalent or exceeding ASTM B 209.

Poles shall be either "Twin-Twenty" style rolled steel lamp post, "Washington" 16 cast iron lamp post, "Washington" 14 N cast iron lamp post, or "Frederick Law Olmsted" lamp post, as specified in the plans.

"Twin-Twenty" style rolled steel lamp post shall be District of Columbia standard street light, type 2C, TWIN A, with foundation and luminaires, in accordance with the following:

The lamp post shall be as detailed on [Drawing M-1](#). Post shall consist of three main assemblies plus two light fixtures. Fixture specifications will be per Washington style luminaire. The post components shall be as follows:

Octagonal cast iron ornamental slip over base per ASTM Specification A48-83, Class 30. Base shall be 25" across flats by 21-3/4" high, weighing 325 pounds \pm 5 percent. Wall thickness shall be 5/8".

Central member of post shall be a fluted shaft of a minimum 11 gauge steel and shall be provided with steel base welded to the shaft for fastening to concrete base by means of anchor rods. Provide a handhole in shaft for wiring. Outside diameter at top shall be 6-1/2". Outside diameter at top of cast base shall be 7-3/4". If new steel Twin Twenty posts are placed near existing cast iron Twin Twenty posts, top and bottom diameters of new steel posts should match those of existing iron posts.

Shaft shall have 16 flutes equally spaced. Steel base shall be secured to lower end of steel shaft by means of a double electric weld. It shall be provided with four holes to receive anchor rods. The top of the shaft shall have a tenon to consist of 3-1/2" schedule 40 pipe, 16" long with 6" of pipe extending beyond top of shaft to accommodate crossarm assembly. The upper crossarm assembly shall be cast iron per ASTM Specification A48-83, Class 30. The upper crossarm assembly shall weigh 270 pounds \pm 5 percent.

Each post shall be equipped with (4) 1" by 40" long with a 4" hook galvanized steel anchor bolts and (2) galvanized nuts and washers.

All castings shall be painted with two coats of iron oxide primer and two finish coats of Benjamin Moore Ironclad Retardo Rust Inhibitive Paint 163, color #80, Black Satin Finish, or approved equal. The steel shaft shall be painted inside and out with iron oxide paint prime coat.

Approximate weight of complete post with crossarm and fixtures is 990 pounds.

"Washington" Style 16 cast iron lamp post shall be of 2 piece construction, as detailed on Drawing N-1, 1 of 2. The post shall consist of a cast base and a cast column. The castings shall be machined for interchangeability per D.C. Department of Public Works standards. The sections are to be as indicated below. The castings are to be true to pattern with 16 flutes. An access door secured with a tamper proof screw shall be provided in the base of the lamp post. All ornamental components shall be cast iron per ASTM Specification A48-83, Class 30.

Column at Base: 7-inch outside diameter
 3/4-inch minimum wall thickness from outer edge
 of flute to inside surface.

Column at Top: 4-9/16 inch outside diameter
 1/2-inch minimum wall thickness from outer edge
 of flute to inside surface.

Base at Base: 24-inch outside diameter
 1-inch minimum wall thickness
 Flange 1-1/8 inch minimum thickness.

Each post shall be equipped with four (4) one-inch diameter by 30-inch long with a 4-inch hook galvanized steel anchor bolts and two (2) galvanized nuts and two (2) washers. Base shall have four (4) 1-3/8 inch slip holes on a 17-inch diameter bolt circle.

All castings shall be painted with two coats of iron oxide primer and two finish coats of Benjamin Moore Ironclad Retardo Rust Inhibitive Paint 163, color #80, Black Satin Finish, or approved equal.

Post height, less luminaire shall be 13'- 2" \pm 5 percent. The vertical light center with the luminaire is approximately 15' - 1". The approximate weight is 770 pounds \pm 5 percent.

"Washington" Style 14 N cast iron lamp post shall be of 2 piece construction as detailed on Drawing N-1, 2 of 2. The post shall consist of a cast base and a cast column. The casting shall be machined for interchangeability per D.C. Department of Public Works standards. The sections are to be as indicated below. The castings are to be true to pattern with 16 flutes. An access door secured with a tamper proof screw shall be provided in the base of the lamp post. All ornamental components shall be cast iron per ASTM Specification A48-83, Class 30.

Column at Base: 3/8-inch minimum wall thickness from outer edge of flute to inside surface.

Column to Top: 7/32-inch minimum wall thickness from outer edge of flute to inside surface.

Base at Base: 17-inch outside diameter.

Each post shall be equipped with four (4) one-inch diameter by 30-inch long with a 4-inch hook galvanized steel anchor bolts and one (2) galvanized nuts and two (2) washers per bolt.

All castings shall be painted with two coats of iron oxide primer and two finish coats of Benjamin Moore Ironclad Retardo Rust Inhibitive Paint color #60, Bronzetone, or approved equal.

Post height, less luminaire shall be 10'- 7 5/8" \pm 5 percent. The vertical light center with the luminaire is approximately 12'-3".

"Frederick Law Olmsted" lamp post shall be of 2-piece construction as detailed on Drawing O-1. The post shall consist of a cast base and a steel column.

The cast iron slip over base shall be per ASTM A48-82. The shaft or column portion of the post shall be manufactured of a minimum of 7-gauge steel, 18' high with a taper of .14" per foot.

The tube shall be of monotube construction. It shall be formed from one piece 7-gauge steel without any sectional horizontal welds other than the weld at the base plate. There shall be a steel base plate at the bottom of the post that is double welded to the steel shaft. The shaft shall have one longitudinal electrical weld which shall be ground smooth after fabrication. After welding, the shaft shall be cold rolled and formed with 16 Doric flutes equally spaced.

Each post will be supplied with 4 anchor rods. Anchor rods shall be 1" in diameter by 40" long and must project 2 5/8" above grade. The anchor rods are to be entirely galvanized. The bolts shall be supplied with galvanized hexagon nuts. The bolts shall be threaded for 4".

All castings shall be painted with two coats of Benjamin Moore Ironclad Retardo Rust

Inhibitive Paint 163, color #80, Black Satin Finish, or approved equal. The steel shaft shall be painted inside and out with a prime coat of iron oxide paint.

All posts shall be manufactured in accordance with the American Association of State Highway and Traffic Officials "Standard Specifications for the Structural Supports for Highway Signs, Luminaries and Traffic Signals."

The Washington Style luminaires shall be designed so as to properly fit and be aesthetically compatible with the cast iron "Washington" style lamp posts.

The luminaire shall consist of three major components:

1. **CAST IRON GLOBE SEAT AND FITTER:**

Design of the seat and fitter shall be such that it provides the same ornamentation as the pole. This casting shall be cast iron as per ASTM A48-72, Class 30. A shop coat of iron oxide metal primer shall be factory applied. Finish coat (2 coats) shall be painted with two coats of iron oxide primer and two finish coats of Benjamin Moore Ironclad Retardo Rust Inhibitive Pain 163, Color #80, Black Satin Finish, or approved equal. Dimensions of the Seat and Fitter shall be as shown on the drawings. Eight (8) weep holes shall be provided in the seat portion of the casting.

2. **ELECTRICAL BALLAST/SOCKET COMPONENT:**

The ballast/socket component shall consist of a utility grade medium base socket mounted on a cast aluminum socket mount which completely covers the wiring and ballast components. Mounting hardware and screws shall be stainless steel. The total component shall be easily removable; complete integral ballast/socket assembly for use with lamp as specified. Primary voltage shall be 120, 208, 240, 277, and 480 volts.

3. **GLOBE ASSEMBLY:**

The globe shall be of the "Washington" style acorn shape manufactured of acrylic or blow-molded polycarbonate, frosted and textured. The Washington globes shall be as manufactured by Formed Plastics, #118 stippled, or approved equal.

The Contractor shall provide certified photometric test data from an independent testing laboratory on the proposed lantern, as well as a computer readout that would indicate light levels and a uniformity ratio for the area to be lit.

The lighting fixture, pole and accessories shall be manufactured by Spring City Electrical Manufacturing Company of Spring City, Pennsylvania, or equal. The criteria for equal equipment shall be construction, aesthetics (similar appearance) and photometric performance.

The Contractor shall provide point-by-point foot-candle printouts of the entire area for evaluation. The printout shall indicate maintained light levels (LLF=.70), uniformity, max., min., average, etc.

The luminaire shall be UL listed.

The lamps for all lights shall be metal halide, C1E 3200 k, diffuse coated and shall meet ANSI

specification M-90.

The Frederick Law Olmsted luminary shall be designed so as to properly fit and be aesthetically compatible with the Frederick Law Olmsted lamp post.

The material of the luminary frame shall be cast iron. The cast iron shall conform to ASTM A48-82, Class 25.

The globe shall be of clear acrylic. The unit shall be lamped for either incandescent or metal halide lighting as specified. The distribution shall be symmetric. The voltage shall be 120, 208, 240, 277 or 480 volts as specified.

The luminaire shall be equipped with a mogul screw base multiple socket. The luminary shall have an internal aluminum reflector. The luminary shall be prime painted per Sherwin Williams Recoatable Epoxy B67H5/B67V5, or approved equal, at the factory and finish painted after installation. The finish coat shall be two coats of iron oxide primer and two finish coats of Benjamin Moore, Ironclad Retardo Rust Inhibitive Paint 163, Color #80, Black Satin Finish, or approved equal.

All hardware shall be stainless steel.

The Contactor shall provide certified photometric test data from an independent testing laboratory on the proposed lantern, as well as a computer readout that would indicate light levels and a uniformity ratio for the area to be lit.

The lighting fixture, pole and accessories shall be manufactured by Spring City Electrical Manufacturing Company of Spring City, Pennsylvania, or equal. The criteria for equal equipment shall be construction, aesthetics (similar appearance) and photometric performance.

The Contractor shall provide point-by-point foot-candle printouts of the entire area for evaluation. The printout shall indicate maintained light levels (LLF=.70), uniformity, max., min., average, etc.

The luminaire shall be UL listed.

Construction Requirements

Regulations and Codes. Furnish materials and workmanship conforming to the standards of the National Electrical Code, local safety code, UL, and the National Electrical Manufacturers Association.

Obtain permits, arrange for inspections, and pay all fees necessary to obtain electrical service.

Notify the local traffic enforcement agency, local utility company, or railroad company, 1 week before any operational shut down to coordinate connections or disconnections to an existing utility or system.

General. At the preconstruction conference, submit a certified cost breakdown of items involved in the lump sum for use in making progress payments and price adjustments.

Fifteen (15) days before installation, submit a list of proposed equipment and materials. Include the manufacturer's name, size, and identification number of each item. Supplement the list with scale drawings, catalog cuts, and wiring diagrams showing locations and details of equipment and wiring.

The Contracting Officer's Representative (COR) will establish the exact location of systems.

Where roadways are to remain open to traffic and existing systems will be modified, maintain the existing system in operation until final connection to the modified circuit to minimize traffic disruptions.

Conduit. Cut conduit so the ends are smooth. Connect conduit sections with couplings to butt the ends of both conduits squarely against each other inside the couplings. Provide a metal expansion and deflection fitting where conduit crosses a structural expansion joint.

Install conduits continuous between outlets with a minimum of couplings to permit pulling conductors. Terminate conduit with bell fittings or bushings to seal out moisture and debris. Furnish pull wires for conduits designated for future cable installation. A mandrel (six inches long by 1/2 inch smaller than conduit) shall be pulled through the conduit, followed by a 1500 pound test polyolefin pull wire. The pull line shall remain in conduit.

Remove and replace crushed, deformed, or damaged conduit. Maintain conduits clean and dry, and protect ends of conduit with plugs, caps, or fittings.

Below roadways, conduits shall be encased with concrete with a minimum of two inches of concrete on sides, two inches between conduits and three inches above and below conduits.

Size pull boxes to provide for termination of the conduit and connection of the conductors.

Installation of Lighting Systems. Luminaries shall be installed in accordance with manufacturer's recommendations. Wiring shall be connected to luminaries using wire connectors. Connections shall be taped and heat-shrinkable tubing installed to form a waterproof connection. Luminaries and mounting poles shall be grounded as shown and specified in accordance with Article 410 of NEC. Design the control unit to energize the lighting circuit upon failure of any component of its circuit. Furnish a control with an "on" level adjustable between 1- and 5-foot candles. Operate luminaries with a parallel circuit distribution system at a potential not exceeding 277 volts.

Control lights and luminaries by photocell controls. For current less than or equal to 10 amperes, furnish a photocell switch. For current greater than 10 amperes, furnish a photocell switch operating a magnetic relay for switching the lighting circuit.

Testing and Demonstration Period. Before energizing any portion of the system, demonstrate that the conductor system is clear and free of all short circuits, open circuits, and unintentional grounds. Repair or replace faulty circuits.

After energizing the system, demonstrate to the COR that all electrical components properly work. Repair or replace faulty electrical components.

After completing electrical component tests, conduct a demonstration test for 30 continuous calendar days. Adjust and correct any deficiencies in the system during the 30-day demonstration period. If any portion of the system is replaced or repaired, retest that portion of the system for an additional 30 calendar days.

Warranties, Guarantees and Instruction Sheets. Deliver manufacturers' warranties, guarantees, instruction sheets, and parts lists to the COR at the final inspection.

Upon completion of the work, also submit as-built drawings showing all detailed changes from the original plans.

Relocations. Use materials equivalent to existing materials, unless present codes require different or improved materials. Existing materials may be salvaged and reused, provided all materials and installation methods used meet the requirements of applicable codes and ordinances.

Measurement

Lighting installation, electrical installation, and relocations will be measured by the lump sum.

Conduits will be measured by the linear foot.

Electrical conductors (wire) will be measured by the linear foot for each size and type furnished.

Luminaries, poles, and pull boxes will be measured by the each.

Relocations will be measured by the each for each fixture designated. Additional line or connections necessary, to place the fixture at the new location will not be measured.

Payment

The accepted quantities, measured as provided above, will be paid at the contract price per unit of measurement for the pay items listed below. Payment will be full compensation for the work prescribed above.

Lump sum items will be paid as follows:

- (a) 75 percent of the lump sum will be paid based on the certified cost breakdown.
- (b) Payment of the remaining 25 percent will be made upon successful completion of the demonstration period.

Payment will be made under:

Pay Item

Lighting installation
Electrical installation
Relocate _____
Conduit, ____ inch, _____
Electrical conductors, _____
Luminaries, type _____
Poles, type _____
Pull box
Relocate _____

Pay Unit

Lump sum
Lump sum
Lump sum
Linear foot
Linear foot
Each
Each
Each
Each

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